

While the preferred embodiments of the invention have been herein described, it is understood that various modification can be made to the present invention without departing from the scope of the invention.

CLAIMS

WHAT IS CLAIMED IS:

1. A sealing system for maintaining a pressure barrier between two volumes of different pressure while facilitating the passing of objects therethrough, said system comprising
a foam seal forming a barrier between said two volumes.
2. A system according to claim 1, wherein
said foam seal has at least one passage therethrough for said passing of objects which is in a closed position when said seal is at rest, and which assumes an opened position when said objects are passed through.
3. A system according to claim 1, wherein
said foam seal is comprised of a closed cell foam material.
4. A system according to claim 1, wherein
said foam seal is generally disc-shaped.
5. A system according to claim 1, wherein
said foam seal is generally cylindrical-shaped.
6. A system according to claim 1, wherein
said foam seal is comprised of an opened-cell foam.
7. A system according to claim 1, wherein
said foam seal is comprised of polyurethane.
8. A system according to claim 1, further comprising
a housing structure to hold said foam seal in a position between said volumes in a manner in which said foam seal is compressed.
9. A system according to claim 8, wherein

said seal is compressed in a direction generally parallel to a horizontal plane.

10. A system according to claim 8, wherein

said seal is compressed in a direction generally parallel to a vertical plane.

11. A system according to claim 8, wherein

said seal is compressed in a direction generally parallel to a horizontal plane and generally parallel to a vertical plane.

12. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter $d1$;

said foam seal having an outside diameter $d2$; and

$d2$ is greater than $d1$.

13. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an interior height $h1$ representing the distance between the floor and the ceiling of the interior of said housing structure;

said foam seal having a height of $h2$; and

$h2$ is greater than $h1$.

14. A system according to claim 2, wherein

said passage is formed by a slit through said seal.

15. A system according to claim 2, wherein

said passage is formed by a slot-shaped hole through said seal.

16. A system according to claim 2, wherein

said passage is formed by a plurality of slits through said seal that intersect at a common point.

17. A system according to claim 1, further comprising

a plurality of passages formed through said seal.

18. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter d_1 ;

said foam seal having an outside diameter d_2 ; and

d_1 is greater than d_2 and said foam seal is movable along a generally horizontal plane.

19. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter d_1 ;

said foam seal having an outside diameter d_2 ; and

d_1 is greater than d_2 and said foam seal is anchored against movement along a generally horizontal plane.

20. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an interior height h_1 representing the distance between the floor and the ceiling of the interior of said housing structure;

said foam seal having a height of h_2 ; and

h_1 is greater than h_2 .

21. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing structure having an inside diameter d_1 ;

said foam seal having an outside diameter d_2 ;

d_1 is greater than d_2 ;

said housing structure having an interior height h_1 representing the distance between the floor and the ceiling of the interior of said housing structure;

said foam seal having a height of h_2 ; and

h_1 is greater than h_2 .

22. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes;

a top opening formed in an upper surface of said housing and positioned generally above said passage; and

a planar adapter adapted to be selectively positioned over said top opening, said adapter having an opening of a diameter different than the diameter of said top opening.

23. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes, said housing comprising a movable component and a stationary component;

said movable component comprising a generally spherical part having a top opening, a bottom opening, and a passage therethrough;

said movable component being mounted to said stationary component; and

said foam seal being mounted across said top opening.

24. A system according to claim 1, wherein

said passage has a maximum horizontal dimension of approximately 4 mm.

25. A system according to claim 24, wherein

said passage is adapted to stretch open to a diameter of approximately 12 mm.

26. A system according to claim 24, wherein

said passage is adapted to stretch open to a diameter of about 15 mm.

27. A system according to claim 1, wherein

said foam seal comprises foam cells of diameters averaging approximately 0.32 mm.

28. A system according to claim 1, wherein

said foam seal comprises closed foam cells of diameters averaging approximately 0.32 mm.

29. A trocar system comprising

a trocar housing having a top, a bottom, a sidewall section, an interior chamber, a top opening in said top and in communication with said interior chamber, and a bottom opening in said bottom and in communication with said interior chamber;

a tube extending downwardly from said housing and being in communication with said interior chamber; and

a foam seal having at least one passage therethrough and being mounted in said interior chamber.

30. A system according to claim 29, further comprising

a second seal positioned in said tube, said second seal having a seal passage therethrough adapted to selectively allow passing of objects through said second seal, and said second seal adapted to seal against pressure exerted upwardly against said second seal.

31. A method of providing an access port in a patient's body, said method comprising

inserting into said patient's body a first end of a tube, said tube being connected at its other to a seal housing;

passing at least one object through a foam seal positioned in said housing and through said tube.

32. A method according to claim 31, further comprising

passing at least one object through a secondary seal positioned in said tube.

33. A method of providing an access port in a patient's body for performing a surgical procedure therethrough, said method comprising

inserting into said patient's body a first end of a tube, said tube being connected at its other to a seal housing;

performing a procedure through a foam seal positioned in said housing and through said tube.

34. A method according to claim 33, further comprising

performing a procedure through a secondary seal positioned in said tube.

35. A system according to claim 1, further comprising

a housing structure to hold said foam seal in a position between said volumes in a manner in which said foam seal is compressed and adapted to remain in compression during passing of objects up to at least 14 mm in diameter through said seal.

36. A sealing system for maintaining a pressure barrier between two volumes of different pressure while facilitating the passing of objects therethrough, said system comprising

a plurality of foam seals forming a barrier between said two volumes.

37. A system according to claim 36, wherein

said plurality of foam seals are stacked relative to one another to form a plurality of generally horizontal layers.

38. A system according to claim 1, further comprising

an elastomeric membrane covering at least one surface of said seal.

39. A system according to claim 36, further comprising

an elastomeric membrane covering at least one surface of one of said seals.

40. A system according to claim 1, further comprising

an elastomeric membrane covering all surfaces of said seal.

41. A system according to claim 36, further comprising

an elastomeric membrane surrounding said plurality of seals.

42. A system according to claim 1, further comprising

a plurality of ribs formed in said passage, said ribs being adapted to flexibly engage an object passing through said passage.

43. A system according to claim 1, wherein

said passage has a varying diameter.

44. A system according to claim 43, wherein

said diameter is smallest in a section of said passage between a top surface and a bottom surface of said seal.